



RESEARCH ARTICLE

ESTABLISHMENT OF NORMS OF UPPER AND LOWER PHARYNGEAL WIDTH IN GARHWALI POPULATION

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ABSTRACT

The present study was done to assess and to establish the norms of upper and lower pharyngeal width for Garhwali population and to determine sexual dimorphism among the population.

Methodology: Sample of sixty Class I subject (30 male and 30 females) with well-balanced face were selected with age group of 18-24 years. Lateral cephalogram of the subjects were taken using natural head position and true vertical line. All reference points, landmarks and measurement were made according to McNamara airway analysis. Lateral cephalograms were digitized using Dolphin software and separate reading for male and female samples were recorded and sent for statistical analysis. The arithmetic mean and standard deviation of pharyngeal width were calculated. Student's t-test was used to compare between pharyngeal width in males and females.

Results: The mean upper pharyngeal width was 15.03 +/- 3 mm and mean lower pharyngeal width was 10.7 +/- 2.5 mm. Significant difference exist in upper and lower pharyngeal width in males and females.

Conclusion: Good compatibility of age and sex seen in pharyngeal width of Class I subjects. Males have higher upper and lower pharyngeal width than females.

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INTRODUCTION

The pharynx is a tube-shaped structure formed by muscles and membranes. It is located behind the nasal and oral cavities and the larynx and extends from the cranial base to the level of the sixth cervical vertebra and the lower border of the cricoid cartilage. Its length is approximately 12 to 14 cm and it is divided into three parts: Nasopharynx, oropharynx and laryngopharynx. The nasopharynx, forming the upper part of the respiratory system, is situated behind the nasal cavity and above the soft palate. Anteriorly, it is connected with the nasal cavity and posteriorly, it continues downward as the oropharynx. The oropharynx, opening into the oral cavity by an isthmus and extends from the second cervical vertebra to the fourth cervical vertebra. The laryngopharynx joins the oropharynx at the level of pharyngoepiglottic fold and the hyoid and then it continues to the level of the sixth cervical vertebra (Blount *et al.*, 1953; William *et al.*, 1989). The nasopharynx and the oropharynx have significant locations and functions because both of them form part of the unit in which respiration and deglutition are carried out.

Because of the close relationship between the pharynx and the dentofacial structures, a mutual interaction is expected to occur between the pharyngeal structure and the dentofacial pattern and therefore justifies orthodontic interest.

A significant relationship exists between airway space and facial morphology (Jung *et al.*, 2007) and also airway space may be affected by conditions such as functional anterior shifting (Ucar *et al.*, 2009), head posture (Zhong *et al.*, 2010), sagittal skeletal relation (Hiyama *et al.*, 2002) and maxillary protraction (Oktay and Ulukaya, 2008). As pharyngeal width may vary in different population and ethnic groups, so the present study was done in Garhwal population. The population of Garhwal region were generally short stature, resemblance of facial pattern from Nepali population and lives in high altitudes. So there was a need of the present study to be done in Garhwali population as no such study has been performed earlier.

AIM AND OBJECTIVES

1. To establish the norms of upper and lower pharyngeal width in Garhwali population
2. To determine the sexual dimorphism among the population.

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MATERIALS AND METHODS

The samples were obtained from OPD (Out patient department) patients of Seema Dental College and Hospital, Rishikesh and from the camps organized in various school and colleges in Uttarakhand. About 900 subjects from various colleges and schools were screened for the collection of sample and a team of a laymen, an artist, a general dentist and orthodontist selected 60 subjects. Informed consent was taken from subjects to participate in study. Study sample consisted of 60 lateral cephalometric radiographs of Garhwali ethnic origin ranging in ages of 15-24 years. Two groups were formed based on their gender i.e. Male (n=30) Female (n=30).

Selection criteria

- Garhwali subjects of 18-24 years of age
- Well balanced face
- Class I molar and canine relation
- Overjet and overbite < 2mm
- Absence of rotation, crowding, spacing, dental asymmetry, dental and skeletal protrusion, crossbite, retained deciduous teeth, supernumerary tooth
- No history of previous orthodontic treatment.
- Breathe comfortably through the nose.
- Absence of any deglutition, visual or hearing disorder.
- Absence of any wound, burn and scar tissue in the neck region.

The following records of the samples were taken

- Lateral cephalograms
- Models—Upper and lower
- Facial photographs:
 - Front view
 - Right-side view
 - Left-side view
 - Occlusal view.

Radiographic technique used

The lateral cephalograms were taken with the sagittal plane at a right angle to the path of the X-rays. The Frankfort plane was parallel to the horizontal plane, the teeth were in centric occlusion, and the lips were lightly closed. Kodak X-ray films (8" × 10") were exposed at 70 kVp; 30 mA from a fixed distance of 60 inches for 2 seconds in the Department of Orthodontics and Dentofacial Orthopedics, Seema Dental College and Hospital, Rishikesh. The cephalograms were firstly converted to JPEG format and then digitized using Dolphin 11.8 software. All reference points, landmarks and measurement were made according to McNamara airway analysis (McNamara, 1984). The upper oropharyngeal width (UOPW) was measured from point on posterior outline of soft palate to closest point on posterior pharyngeal wall and lower oropharyngeal width (LOPW) was measured from point of intersection of posterior border of tongue and inferior border of mandible to closest point on posterior pharyngeal wall. The measurements were recorded by a single investigator and were reviewed twice by other investigators for accurate landmark

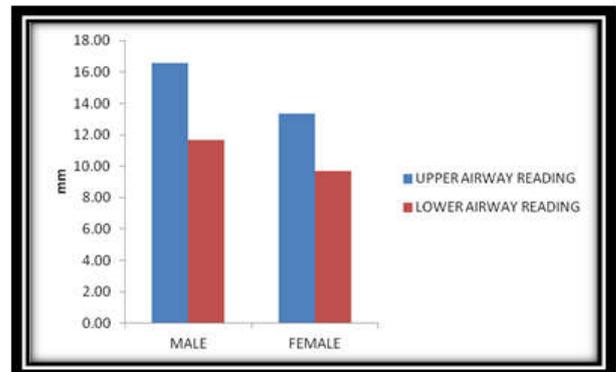
identification. To eliminate error, 20 randomly selected cephalograms were traced twice by the same operator to evaluate the reliability and reproducibility of landmarks and measurements.

Statistical test

- The arithmetic mean and standard deviation of pharyngeal width were calculated.
- Student's t-test was used to compare between pharyngeal width in males and females.

RESULTS

The present study was conducted on 60 lateral cephalograms of subjects with Class I molar and canine relation. The upper and lower pharyngeal width was measured in all lateral cephalograms. The observations collected for the parameters were subjected to statistical analyses. The data thus obtained was used to study any relationship of these parameters between males and females. The mean upper pharyngeal width was found to be 15.03±3mm and mean lower pharyngeal width was found to be 10.7 ±2.5 mm. There exist a significant difference in upper and lower pharyngeal width in males and females. The mean upper pharyngeal width in male sample was 16.57±3mm while in female sample it was 13.34±2mm. The mean lower pharyngeal width of male sample was 11.64±2mm while in female sample it was found to be 9.7±1.7 mm.



Graph 1. Represent the pharyngeal width in males and females

DISCUSSION

Good compatibility for age and sex was observed in the present cross-sectional study. Because only healthy pharyngeal subjects with Class I malocclusion were selected, we estimated that the oropharyngeal airway space would reflect only natural anatomic conditions without pathology. To eliminate the influences of growth and aging, postpubertal subjects were selected for the current study. Malkoc *et al.* (2005) has stated that cephalometric films are significantly reliable and reproducible in determining airway dimensions. The similar results were found in study done by Agarwal *et al.* (2011) in Jaipur population. Gupta and Subrahmanya, (2014) studied the oropharyngeal width in different facial skeletal pattern and

found that significant difference exist between male and female samples.

Conclusion

Statistically significant differences were identified in pharyngeal width measurements among Class I subjects with different sex. There was increased reading of pharyngeal width in male samples when compared with female samples.

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